

A TORSION-ROTATION-VIBRATION INTERACTION ANALYSIS OF THE LOWEST IN-PLANE
BEND AND FIRST EXCITED TORSIONAL STATE ROTATIONAL SPECTRUM OF THE C_{3v}
INTERNAL ROTOR C_2H_5CN

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The close proximity of the bend and torsion states of C_2H_5CN (Propionitrile or ethyl cyanide) and their low lying (206 cm^{-1}) nature make them an ideal choice for a millimeter- and submillimeter-wave high resolution study of the complex and largely unexamined interactions among torsion, vibration and rotation in a simple C_{3v} internal rotation case. In order to understand the fine details of these interactions, several thousand rotational transitions in the lowest excited in-plane bend and first excited torsional state have been recorded, assigned and analyzed in the 80-422 GHz spectral region. The analysis of the data reveals very strong a- and b-type Coriolis interactions and a number of other smaller interactions. The relative importance and the physical origins of the coupling among the rotational, vibrational and torsional motions will be presented along with a full spectroscopic analysis. A number of important implications for other C_{3v} torsion-rotation-vibration systems will be elaborated.